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Title: **NEW TECHNIQUE FOR DETERMINING BOUNDARY DOSE FROM THE LOS ALAMOS MESON PHYSICS FACILITY**

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I. INTRODUCTION

The boundary dose measurement system described here is designed to determine, in real time, the radiation dose resulting from operations at Los Alamos National Laboratory's Meson Physics Facility, LAMPF. Dose at the Laboratory boundary is currently determined through computer modelling, using measurements made at the point of emission.

The current model, however, may not account for variations in wind patterns that could affect the LAMPF plume as it moves toward the boundary, 700m or more from the point of origin. Such variations are the result of the local topography. The LAMPF measurement system is intended to correct for these possible variations, refining dose estimates through actual measurements made near the site boundary.

II. FUNCTIONAL DESCRIPTION

There are three stations in the LAMPF monitoring network, bearing 0 , 22.5 and 45 from the target stack (Figures 1 and 2). Each system consists of an IBM-compatible computer and an EG&G Ortec 92X Spectrum Master integrated spectroscopy system connected to an upward-looking high-purity germanium detector. A typical detector and spectroscopy system is shown in Figure 3. The detectors, which have a nominal efficiency of 40%, are designed to detect photons in the energy range of 40 keV to 10 MeV.

Each spectroscopy system collects a 16,000-channel pulse height spectrum from its associated detector. This system also provides detector bias, amplifier gain, and pole-zero adjustments, all under computer software control.

To ensure protection from powerline dropouts the computers, the spectrocopy systems and the detectors are powered from uninterruptible power supplies (UPS). Each UPS will provide up to two hours' operating time in the event of a power failure. The station computers are connected to a host computer--also an IBM compatible--via a dedicated telephone line.

III. SOFTWARE

The control program running on each station computer controls spectrum acquisition independently. In operation, the software initiates a data acquisition cycle on the spectroscopy system and waits for it to complete. Every acquisition is started on the hour, and uses a collection time of slightly less than an hour.

When acquisition is complete, a pulse height spectrum is stored on the computer, and a new data acquisition cycle is initiated. Gamma dose is then calculated on the stored spectrum using a technique originally developed to measure gamma exposure rates with a GE spectrometer (Miller 1984). The 511-keV activity in the stored spectrum is used to determine the presence of air activation products from the accelerator beam. If the 511-keV peak in any hour's spectrum is determined to be 2 or more higher than the mean 511-keV background, that portion of

induced. The LAMPF-induced portion of the total dose is then stored as a LAMPF boundary dose. Each day the previous 24 hours' LAMPF dose results are summed and reported as the daily gamma dose from accelerator operations. These results are downloaded to the host computer, where they are logged to the screen and to a printer, providing a permanent dose record.

The control software for the measurement stations is menu-driven, and is designed to be flexible and intuitive. The menu (Figure 4) allows an operator to change preset count times, elect to save spectra after any number of collection intervals, and choose autoincrementing filenames under which to save spectra. Setup information such as filenames, time of day, date and presets are also displayed continuously.

The control software runs each measuring station independently of the other stations and the host computer. This prevents a failure in a single station from disabling the entire system. System failures in each station are logged to the station printer to provide a record of operations.

If a fault in any station occurs (such as a power failure) the host computer is notified immediately. The host then logs the message to its screen, alerting the operator to a problem. This provides immediate indication of problems and helps to minimize system downtime.

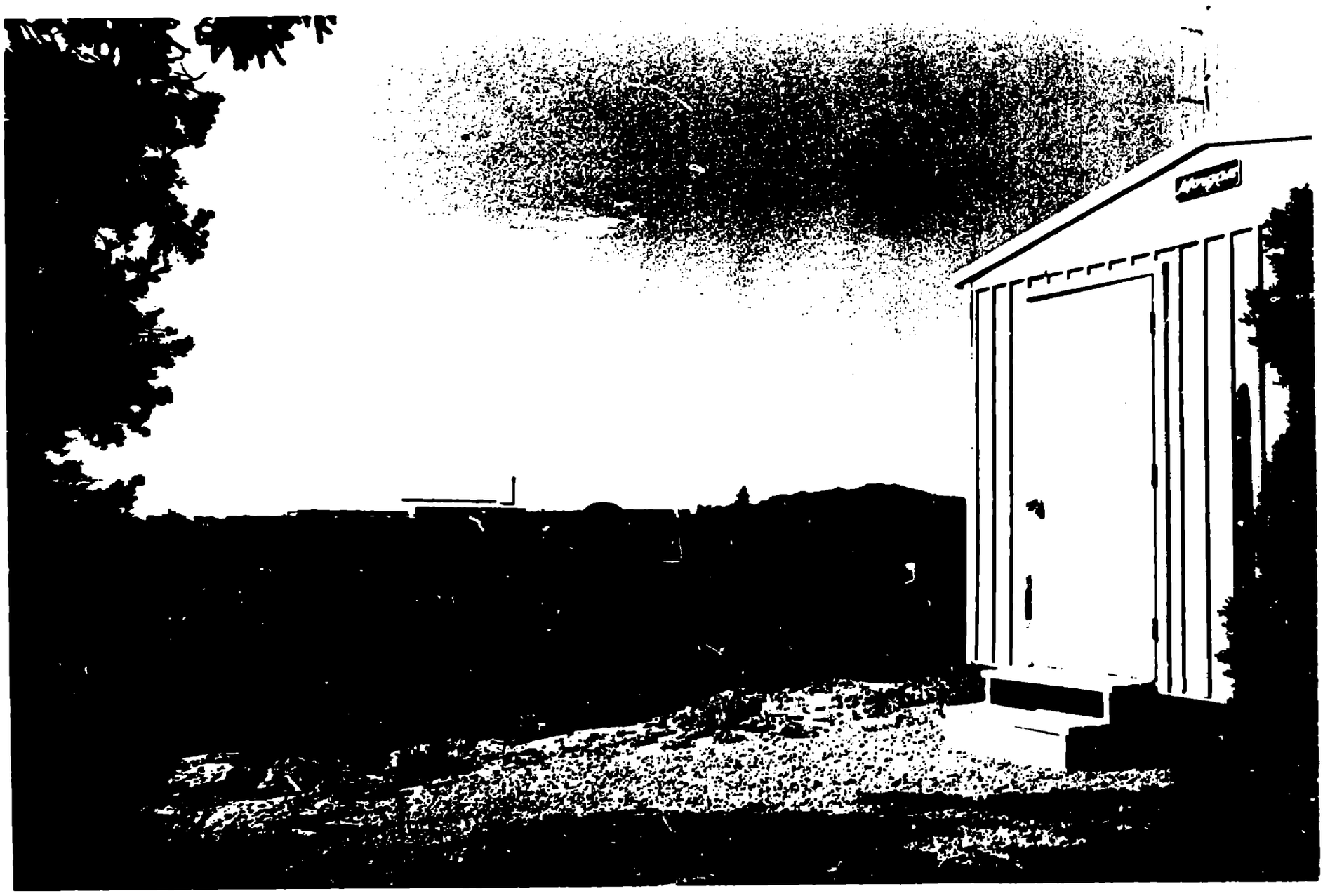
For security purposes each station is fitted with a switch that senses when the door is opened or closed. When a door is opened or closed a message is sent to the host computer and logged to the local printer. This allows recording of any access--authorized or not--to any remote station, and helps to maintain the integrity of the data.

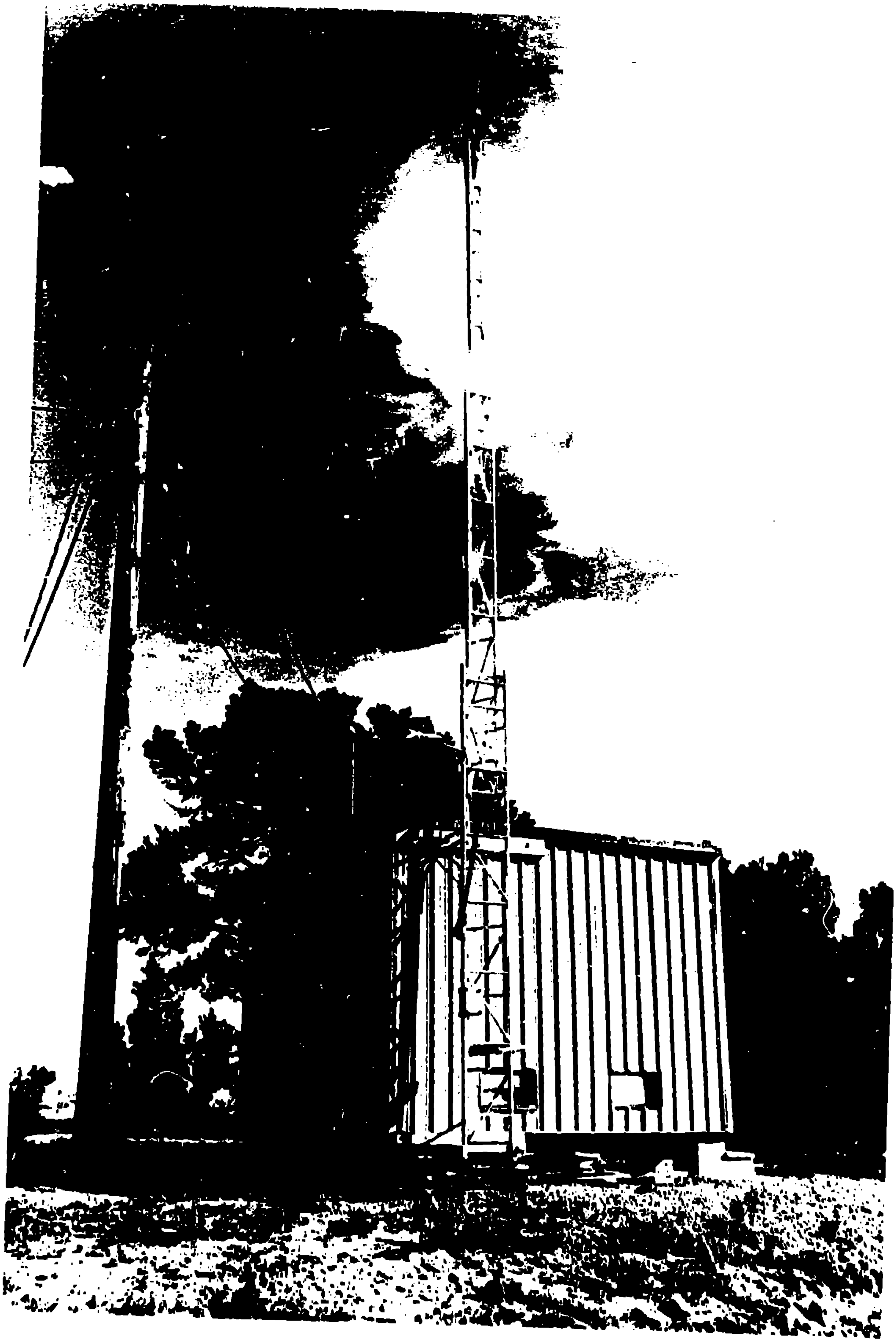
IV. Acknowledgements

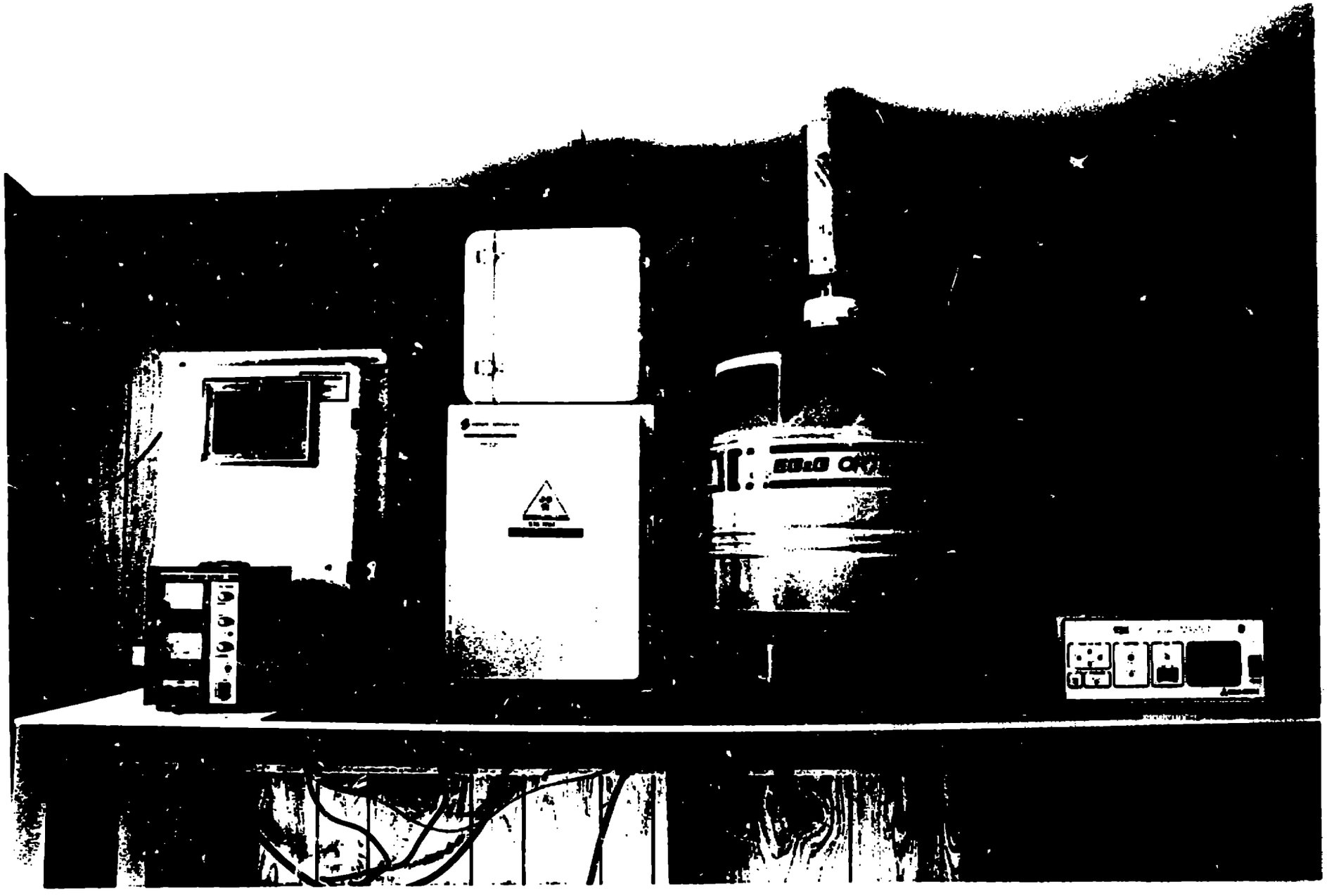
The authors wish to express our gratitude to Thomas Buhl and Donald VanEtten of LANL, who first proposed the concept of a boundary dose measuring network, and laid the groundwork for the system now in use. We would also like to thank John Telford of Los Alamos Technical Associates, who derived the dose calculation algorithms for the measurement system.

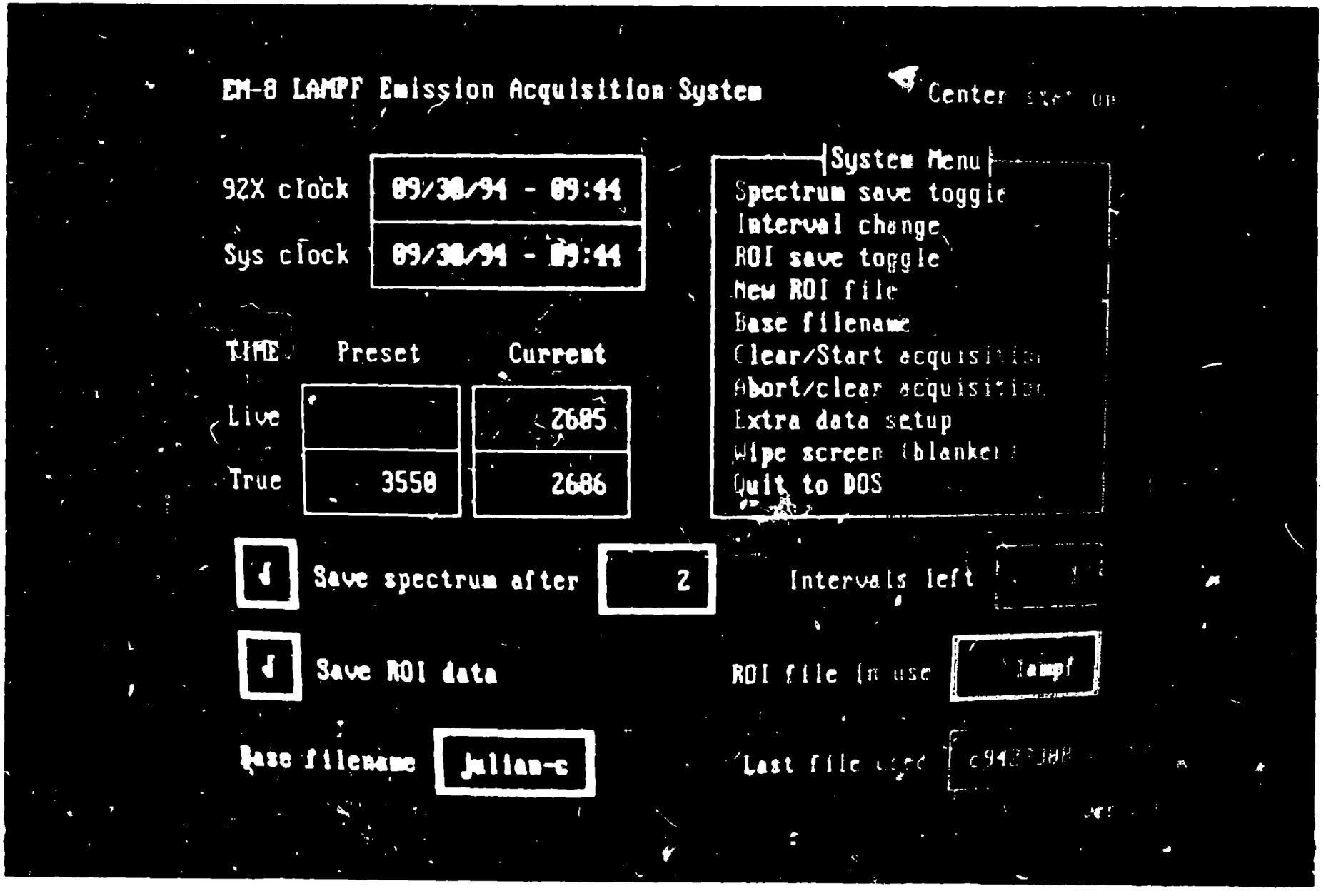
References

Kevin M. Miller, "A Spectral [illegible]
Used for [illegible]
[illegible]








EM-8 LAMPF Emission Acquisition System
Center
92X clock
09/30/94 - 09:44
Sys clock
09/30/94 - 09:44
System Menu
Spectrum save toggle
Interval change
ROI save toggle
New ROI file
Base filename
Clear/Start acquisition
Abort/clear acquisition
Extra data setup
Wipe screen (blanker)
Quit to DOS
TIME
Preset
Current
Live
2685
True
3550
2686
Save spectrum after
2
Intervals left
Save ROI data
ROI file in use
lampf
Base filename
julian-c
Last file used